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## Uncovering Sex-Change Secrets Of The Black Sea Bass

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DURHAM, N.H. -- In a former cowshed on the edge of the University of New Hampshire campus, David Berlinsky, assistant professor of zoology, peers into a big blue plastic tub. Inside, black sea bass circle slowly in the dim light. The converted barn is now an aquaculture research facility for the College of Life Sciences and Agriculture, and home to Berlinsky's latest research.

Black sea bass feature prominently on many menus, but wild populations of the fish are in decline and their availability is limited. Because of the high demand, they're a good candidate for aquaculture on the east coast. Except, that is, for one problem: they have a tendency to change sex unpredictably in captivity.

"In the wild, black sea bass are born as females and turn into males at around two to five years old," Berlinsky explains. "When you bring them into captivity, they change into males more quickly." Some captive-born fish emerge as males even before reaching adulthood, devoting energy toward reproductive development and away from growth. Such problems make breeding and growing the fish in captivity a tricky proposition.

"Black sea bass is a wonderful fish to culture and to eat," says George Nardi, vice president and director of GreatBay Aquaculture, a commercial fish farm in Newington, NH. But the sex change problem must be tackled if fish farmers are to bring a high-quality fish to market. "We invest in our brood stocks, the parents of the young fish, much as a thoroughbred horse farm invests in mares and stallions," he says. "It doesn't do us much good if we always have to go out and get new females."

With funding from NH Sea Grant, Berlinsky has teamed with Nardi and GreatBay Aquaculture to study what triggers sex reversal in black sea bass – and how to prevent it. Berlinsky and his colleagues have discovered that fish are more likely to become males if raised at constant temperatures. But temperature is hardly the only factor involved. Sex ratios and density also come into play. Berlinsky's team found that females were more likely to change sex when no males were present in the tank. Additionally, the fish were more likely to turn into males when kept in crowded tanks.

Berlinsky is continuing his experiments to clarify the role that water temperature plays and to further understand what factors determine the initial sex of captive-born fish. He's also collaborating with Canadian researchers to study the underlying biochemical mechanisms that cause the fish to change sex. In female fish, estrogen plays the major role, he said. In males, a steroid hormone called 11-ketotestosterone is involved. The scientists are now studying those hormones as well as the enzymes that control them.

By turning off estrogen production, Berlinsky says, he can turn a female fish into a male within a week. Giving 11-ketotestosterone to a female converts it into a male. "We're studying the ways to control the enzymes that control sex reversal," he explains. "We're coming at the problem both behaviorally and biochemically."

Though he still has details to sort out, Berlinsky believes he has already made important steps. "We have already made progress, determining optimal sex ratios and delaying sex reversal by controlling density," he notes. "We've already made strides toward making black sea bass aquaculture possible."